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GOVERNMENT CONCEPTUAL ESTIMATING FOR CONTRACTING & MANAGEMENT

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ABSTRACT

This report explains the use of the Aerospace Price Book and KSC Cost Index for Government Conceptual Cost Estimates for Kennedy Space Center's launch facilities and ground support equipment.

The Aerospace Price Book has been developed since 1974 with over three volumes of cost data based on Government estimates totaling over $500 million. The KSC Cost Index has also been developed since January 1974 with over 140 issues. The Price Book contains over 200 commonly used conceptual elements and almost 100 systems summaries of such projects as launch pads, processing facilities, air locks, and steel/shielded buildings. Some of the over 200 commonly used elements and systems are tower steel for service structures, steel/aluminum access platforms, mating devices, Payload Changeout Room (PCR) special doors, pneumatic remote control panels, PCR bridge hinged column bearing assembly, Halon systems, stainless steel pipe runs, uninterruptible power systems, Orbiter access platforms, and fiber optic cable system.

One of the best methods for making ROMs (rough order of magnitude) conceptual estimates is to find similar items, buildings, systems, elements, and assemblies already designed, built, and costed and to adjust that cost for time, location, and current design requirements. With the aid of these unit bid prices, KSC conceptual budget estimates are more accurate and timely. The prices also serve as a rule-of-thumb and cross-check feedback for detail evaluating designed priced-out project cost estimates. A simple example using the Cost Index and Price Book to make three different types of conceptual estimates for a $10 million project will be shown along with a case study of a conceptually designed $5 million project.

INTRODUCTION

Cost data is published by many organizations, and it is used for budget, funding, cost estimates, and preliminary engineering reports. What is important is the decision to collect such cost data in a completely new industry (the Space industry) right from the beginning of the Space Shuttle era. This report is meant to encourage engineers engaged in research and development projects to recognize the similarity of the repetitive elements and to collect and organize cost data for use in estimating future projects.

SPACE SHUTTLE CONCEPTUAL ESTIMATING - COST MANAGEMENT BACKGROUND

The successful construction of the KSC Shuttle facilities under budget on schedule is attributed to the remarkable KSC Design Engineering and construction management team. This is especially noteworthy for a research and development project. Many R&D projects during the 1970's were costing two to three times budgeted costs due to the (1) energy crisis, (2) social, environmental, and economic regulations, (3) environmental requirements and concerns, and (4) erratic (volatile) economy.

These and many special and unique problems were solved by fast tracking, detail planning and scheduling, cost engineering and design engineering solutions through an unusual efficient dedicated construction management program. The use of KSC estimating specifications to standardize cost estimating formats, the KSC Cost Index, and the KSC Price Book to provide more accurate cost data served as an important cost engineering tool in this unusual, challenging effort.

Aerospace construction is similar to building, civil, petro-chemical process industry, construction in that it uses concrete, steel, form work, and most conventional materials; but it is different and more costly due to its higher reliability requirements, tolerance, and safety requirements because of the hazardous operations, remote controlled fuels and gases, and some exotic materials, etc.

The concept for the KSC Shuttle facilities was developed in the late 1960's and early 1970's based on limited criteria, horizontal concept, reuse of Apollo facilities (as much as possible), and two simultaneous Shuttle-Orbiter flows (conceptually costed by KSC's Design Engineering between March - October 1970.

The conceptual construction cost estimate of facilities was $147,573,000 which included 10% contingencies and 7% supervision and administration during

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construction. (This was further developed and escalated to $297,330,000 including ground support equipment.)

The construction of facilities was budgeted in the early 1970's at $150 million of 1970 dollars. The actual in-place cost through April 1980 was $225.3 million which is about 2% less than the original escalated budgeted amount. Quite a remarkable achievement. Some important scope changes that made this cost management more critical was the added Sound Suppression System and the redesign of the Rotary Service Structure for extra Air Force requirements after bidding LC-39 Pad A (during construction of the foundation).

BACKGROUND OF THE AEROSPACE PRICE BOOK

The KSC Price Book was created by the author as KSC Lead Cost Engineer in late 1974 as part of TR-1511, "KSC Monthly Facility and GSE Cost Index" to provide rule-of-thumb cost of aerospace facility construction costs since no such information was available. The October 10, 1974 Cost Index had 21 systems unit costs. On April 21, 1976, the compilation of the development of 54 budget unit costs were first printed. It was published every six months until October 1980 when it became an annual publication. A recent publication (February 4, 1983) contained over 300 pages of cost data. The 1984 and 1985 editions were in three volumes. The 1985 edition has 485 pages.

Purpose

The purpose of this Price Book is to:
a. Show the compilation of KSC labor and materials prices with typical markups.
b. Show the development of rule-of-thumb (ROT) unit prices for aerospace elements and systems.
c. Record major projects costs and KSC-unique cost engineering experience for conceptual estimates now and for future computer database.
d. Aid in the development of automated conceptual estimating system for aerospace construction and ground support equipment.
e. Aid in cross-checking detail labor and material Government estimate for current prices and serve as a checklist of necessary items to prevent omissions.
f. Provide better, more accurate consistency and uniform cost estimates in a timely manner now and in the future.

TR-1508 - What Is It?

TR-1508, "Budget Cost Data for Construction and GSE Elements" is a 485-page price book for KSC construction and GSE. It is divided into three basic parts - the first is bid abstracts of major Shuttle projects; the second part is the budget cost data divided into 16 CSI/SPECSINTACT divisions, and the third part is the system summary of 105 typical projects.

Part I - Summary of Bids

Part one lists over 350 major Shuttle projects with the bid date, successful low bid, bidder, and the Government estimate for comparison. The total Government estimates of these projects is $413,372,330 which averages 8.4% above the low bidders. The position of the Government estimate is 3.6% of the 7.3 average bids. Exhibit A is a bid summary and sample format.

The low bidder averaged 7% under the Government estimate.

The position of the Government estimate average is 3.8 of 7.1 bids for 152 projects.

Part II

In part two, the budget cost data sheets are divided into the 16 Construction Specification Institute SPECSINTACT divisions with a typical example cost data description for each division.

Division 1: Overhead General Conditions - Payroll Tax and Insurance
Division 2: Earthwork - Piling and Road Paving System - Demolition
Division 3: Concrete - Concrete Wall Trench System-Floor Slab
Division 4: Masonry - Concrete Block Wall System
Division 5: Metals - Structural Steel Service Structure
Division 6: Wood and Plastic - Wood Stud Drywall System
Division 7: Thermal and Moisture Protection - Insulated Roof Decks
Division 8: Doors and Windows - Special Hinged Insulated Door
Division 9: Finishes - Suspended Acoustical Tile System
Division 10: Specialties - Mesh Partitions
Division 11: Equipment - Laboratory
Division 12: Furnishing - Carpeting
Division 13: Special Construction - Elevated Floor System - Metal Building
Division 14: Conveying System - 125-Ton Bridge Crane-RSS Drive Trucks
Division 15: Mechanical - RSS Bridge Hinge Column - PSCL A/C
Division 16: Electrical - Emergency Light System - Fiber Optics Cable

The cost data sheet shows quantities, detail labor and materials breakdown for the major cost items for each system. It includes the normal contractor mark-ups for PT&I, sales tax, overhead, profit, and bond.

For other sample breakdowns, see Conceptual Cost Estimating using KSC Budget Cost Data for Construction Management of Space Shuttle Facilities.

The unit prices shown above in rectangles cost/linear foot [$267], cost per cubic yard [$742], cost per square foot $124, are published in the KSC Monthly Cost Index. See Figure D for sample summary.

Figure D (below) from TR-1511 is a sample of a Unit Summary from KSC Cost Index dated March 17, 1983.

Part III - Cost Management Summaries

Part three consists of sample cost management summaries for (1) budget line items which show the budget 30%, 60%, and 90% design estimates compared to

the final Government estimate, (2) a projects labor and materials summary showing a detail breakdown of the architectural/structural, mechanical and electrical costs with the contractor's markups shown separately, and (3) systems summaries broken down into 16 CSI/SPECSINTACT divisions with major quantities and unit prices. This summary also includes project descriptions, design data, scope special features, bidders and bids, and estimating comment. Some of the facilities systems' summaries are for LC-39 Pad B and RSS, Orbiter Mate Devices, HB-2 OPF Platforms, Shuttle Payload Vertical Processing Facility, Crawler-Transporter Maintenance Facility, Life Science Support Facility, etc.

Figure E is a sample system for the Solid Rocket Booster Rotation and Processing Facility. This project was bid on 3/23/82 and consisted of four separate buildings. The buildings are: (1) the 18,628 square foot Rotation and Processing Building, (2) a 5,000 square foot Office Support Building, and (3) and (4) two Rocket Booster Storage Buildings 65'x90' long x 47' to 62' high for a total square footage of 11,700 square feet.

The Government Estimate without Special Conditions was $7,690,060 which compares very favorably with the two tied low bids of $7,247,000 (a minus 5.8% of the Government estimate). The Special Conditions were not needed due to the recession and the large number of bidders.

Note arrows in right border. See comments at Arrow #1. Arrow #2 points to special features such as two 200-ton electric bridge cranes bid at $1,798,000 at "Note in Contract". Arrow #3 gives the estimated cost per square foot for the Rotation Building at $203.72 for the architectural/structural portion. Arrow #4 notes the tie bid. NASA Procurement required labor surplus evaluation. After a thorough review of the contractor's bid breakdown for both low bidders showing less than 50% of work in labor surplus areas, the award was made to the Small Business Firm. Arrow #5 shows the actual bids and bidders' names.

The left-hand and center portion of Figure E shows the Unit Costs for the 16 CSI Divisions per building square foot, tons of steel, and cubic yards of concrete, etc. Some especially interesting items and costs are: Division 8: Vertical Lift Doors at $131.89 per door square foot; Division 14: a 90-foot high passenger elevator at $164,395; railroad at $295.16 per linear foot; Division 16: electrical, electronic security $3.79 building square foot, and cathodic protection at $0.76 building square foot.

See attached Figure E - System Summary Sample.

CONCEPTUAL ESTIMATING

Why Conceptual Estimates?

Conceptual estimates of KSC facilities and ground support equipment are required to provide the most probable project cost for budget, funding, and project approval purpose. The conceptual estimate is continuously used throughout the project development cycle to compare the further defined cost estimate with the approved estimate with detail quantities. The labor and materials are evaluated against the budget to assure costs are within budget dollars and can be awarded to the successful bidder.

How to Make Conceptual Estimates

One of the best methods for making ROM conceptual estimates is to find similar items, buildings, systems, and elements already designed, built, and costed and adjust that cost for time, location, and current design requirements. With the aid of these unit bid prices, KSC conceptual budget estimates are more accurate and timely. The prices also serve as a rule-of-thumb and cross-check feedback for detail designed priced-out project cost estimates.

In making conceptual estimates, it is important to first determine the purpose of the estimate. Next, find a similar project and adjust for time, location, and design or conceptual design and conceptual estimate using conceptual unit prices such as developed in this price book. Next, add for escalation to the estimated mid-point of construction, contingencies, supervision, and administration during construction. The cost of design and/or construction management is usually estimated separately since it is funded separately.

Simple Example of Conceptual Estimate

A simple example for conceptual estimate for a new Solid Rocket Booster Facility for rotation, processing, and storage of additional boosters with a new 1,000-foot pipe trench and a new Orbiter contamination control system would be:

1. New SRB Building and Sitework: The Government estimate for SRB Facility bid March 1982 was $7,960,000 (see Figure E, page 10). KSC Cost Index dated March 1983 - Index Factor #3916 divided by KSC Cost Index March 1982 - Index Factor #3674 = #1.0659 x $7,690,000 (bid price) = $8,196,771

or

$$\frac{3916}{3674} = 1.0659 \times \$7,690,000$$

$$= \$8,196,771$$

2. Exterior Site Work - New Pipe Trench: New pipe trench 1,000 feet at $267 per linear foot (Figures C and D, pages 7 and 8. KSC Cost Index March 1983 - Index Factor #3916 divided by KSC Cost Index October 1982 - Index Factor #3770 = #1.0387 x Budget Unit Price of $267 per linear foot = $277.33/adjusted linear foot. 1,000 feet at new escalated unit price of $277.33 per linear foot = $277,330

or

$$\frac{3916}{3770} = 1.0387 \times \$267/LF = \$277.33/LF \times 1,000'$$

$$= \$277,300$$

3. New Specialized Construction System: Add for new Orbiter Contamination Control System similar to one bid 10/7/82. The Government estimate was $1,289,278 (see Exhibit A, page 6). KSC Cost Index March 1983 - Index Factor #3916 divided by KSC Cost Index October 1982 - Index Factor #3770 = #1.0387 x Bid Price $1,289,278 = $1,339,183

or

3916 = 1.0387 x $1,289,278 = $1,339,183
3770

Total estimated construction bid cost March 1983 for a new SRB Facility with 1,000-foot pipe trench and new Orbiter contamination control system = $9,813,274. Round to say $9,813,300. Escalation from March 1983 to August 1985:

Aug '85 Index Factor 4217 = 1.08 x 9,813,274
Mar '83 Index Factor 3917
= $10,567,562
Round to say $10,568,000. Total as of August 1985: $10,568,000

Estimate Notes

Note 1: Add for future escalation, contingencies, supervisory, administration and design as required.

Note 2: Bridge Cranes: Two 200-ton electric bridge cranes are not included. These are assumed to be R&D funded and not in construction contract.

Note 3: Confidence factor plus or minus 10% due to excellent Government estimates and bid data.

Author's Note

The bid prices were escalated using the KSC Cost Index Factors to March 1983 and August 1985.

This simple example of conceptual estimating for a new SRB Facility shows how all three parts of the Aerospace Price Book can be used for making conceptual cost estimates in a timely manner. Section 1 above was taken from the Price Book, Part Three, the Detail System Summary; Section 2, Part Two of the Budget Cost Data Sheets; and Section 3, from Part One, the Summary of the Abstract of Bids.

CONCLUSION

The Aerospace Price Book, KSC Cost Index and Conceptual Cost Estimating are some of the tools used by KSC Design Engineering to provide cost effective design and construction of KSC Space Shuttle facilities. These facilities are being used successfully to process, checkout, launch and recover elements of the Space Transportation System which assures the United States' continued preeminence in space exploration and development.

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(Sample from 1982 Edition)

Project, Date and Bids		Low Bid	Gov.Est.	%	Gov.Position/Total
CXLVI	196 Unit Modular Housing Complex LC-39 Bid 7/6/82 Moduler - Concert.	2,771,530	3,200,800	-13.4	#2 of 22
CXLVII	Orbiter Environmental Control Sys Facilities Bid 8/19/82 Holloway Corp.	1,269,770	1,295,261	2.0%	5/7
CXLVIII	MMSE Payload Handling Fixture Bid 8/27/82 Specialty Maintenance	318,557	548,327	-21.5	4/5
CXLIX	Orbiter Payload Canister ECS Bid 9/9/82 KECO Industries	159,416	180,000	-11.4	2/4
CL	Centaur Test Tower LETF Bid 10/7/82 W&J Construction Corp.	222,114	291,403	23.8%	7/9
CLI	OPF Contamination Control Bid 10/19/82 David Boland Inc.	1,252,000	1,289,278	2.9%	3/10
CLII	O&C Baseline Data Collection Fac. Bid 10/21/82 Florida General Contr.	147,900	173,477	14.4%	6/9
	TOTAL	241,370,021	259,646,994	7.0%	543 of 1021 AVG 3.8 of 7.1

The low bidder averaged 7% under the Government estimate

The position of the Government estimate average of 3.8 of 7.1 bids for 152 projects

Exhibit A

The low bidder averaged 7% under the government estimate.

The position of the government estimate average of 3.8 of 7.1 bids for 152 projects.

Figure D, below, from TR-1511, is a sample of a Unit Summary from KSC Cost Index dated March 17, 1983.

Figure D. Unit Price Summary

INDEX

SUMMARY OF UNIT PRICES FROM AEROSPACE CONSTRUCTION PRICE BOOK BASED ON BIDS AND GOVERNMENT ESTIMATES

THE FOLLOWING ENGINEERING COST INCLUDE LABOR, MATERIAL, TAX, INSURANCE, OVERHEAD AND PROFIT. THEY DO NOT INCLUDE DESIGN, SPECIAL CONDITIONS, GOVERNMENT CONTINGENCIES OR SBA. RACKUP DATA IS AVAILABLE FROM BD-FEB-1 AND [illegible] IN-14WK.

	PRICE BOOK PAGE	SEC. DIV.	DESCRIPTION	SPEC. REF.	DESCRIPTION	COST UNIT	COST UNIT
	21	1B	General Cond.	01095	Overhead & General Condition - Avg. 15%	4%	2%
	22	1B	General Cond.	01095	Wage rates P.T.&I. - Avg. 22%	19%	2%
	23	2A	Demolition	02050	Relocation of building from LC-39 to LC-39B	50,400 Ea.	11.00 SF
	24-25	2A	Demolition	02050	Move and alteration cost estimate guide (FC54)	4.00 LF	50.00 LF
	26	2A	Demolition	02050	Demolition of slab (no rehab of area)	79.35 CY	1.79 SF
	27	2A	Demolition	02050	Demolition of slab and rehab area	84.15 CY	1.90 SF
	28	2A	Demolition	02050	Demolition - Conc. masonry walls (cavity)	1.49 CF	1.10 SF
	29	2A	Demolition	02050	Demolition - Drywall/steel stud	10.37 EA	1.02 SF
	30	2A	Demolition	02050	Demolition - Reinforced solid conc. fond.	4007 EA	101.74 CY
	31	2B	Site Work	02229	Earth work clearing and grubbing - Easy-Hard	1,775 Acr.	2,500 Acr.
	32	2D	Site Work	02229	Dewatering (excavation)	5257 EA	52.57 LF
	33	2D	Site Work	02229	Excavation (hand, machine)	29.31 CY	2.94 CY
	34			02204	Fill - Unclassified borrow pit, Orbiter Landing	40,364 EA	4.04 CY
	35	2GHK	Piling OPF	02354	OPF piling wood, conc. st. 8" to 14" (10,330 Ft.)	11.37 LF	13.00 RSU
	36	2HK	Piling Pad "B"	02364	Pad "B" piling Conc. - Steel	13.00 LF	23.00 LF
	37	2D	Site Work	02204	Orbiter Landing Viewing Stand - Basic 750'	41,000 CY	3.15 CY
53				02722	Sewage Treatment Plant 1000 GPD	23150 EA	23.15 GAL
54	3A	Concrete		03300	Slab 6" on grade w/thickened edge	191.15 CY	3.54 SF
55	3A	Concrete		03300	Concrete for 6" slab on grade w/thickened edge	157.49 CY	2.92 SF
56	3A	Concrete		03300	Concrete walled trench with support blocks and grating	7424 CY	267.32 LF
57	3A				Form work for concrete walled trench	219.33 CY	78.96 LF
58	3A				Rebar for concrete walled trench	14.17 CY	5.10 LF
59	3A				Concrete for concrete walled trench	148 CY	53.00 LF
60	3A				Grating for concrete walled trench	307.72 CY	110.78 LF
61	3B	Precast Conc.		03430	Tilt panel exterior wall	11.90 SF	11.44 SF
62	3C	Precast Conc.		03413	Structural concrete, piers, beams, columns	864.00 CY	32.00 LF
63	3C				Form work for piers, beams, column, etc.	682 CY	75.26 LF
64	3C				Rebar for piers, beams, columns, etc.	162 CY	.72 LB
65	3C				Concrete for piers, beams, columns, etc.	106 CY	3.93 LF
66	3D	Lightweight Conc.		03341	Lightweight insulation concrete roof slab	7901 EA	1.58 SF
67	3E	Precast Conc.		03461	Prestressed roof system	21,095 EA	4.27 SF
68	3M	Grout		03606	Embeco grout	337 CF	3.51 SF
69	4A	Block Masonry		04200	Concrete block wall	5.89 SF	4.91 BLK
70	4A				Block & mortar 8 x 8 x 16	3.78 SF	3.15 BLK
71	4A				Insulation 1" polystyrene	.54 SF	.45 BLK
72	4A				Drywall 1/2" thick fire resistant	1.44 SF	1.73 BLK
73	4A				Paint (2 sides exterior & interior)	1.25 SF	1.04 BLK
74	4/5				Orbiter Processing Facility, Phase I Struct.	1208 TON	152.63
75	4A				OPF Phase I Mech. Summary	1,239,892 EA	2190.62 TON
76	5B	Sys. Str. Steel		05210	Structural steel building	3887 TON	
77	5C	Steel Joists		05210	Roof Structural steel	9,091.00 EA	7.56 SF
78	5F	Metal Floor		05310	O&C Mods, Integrated test stands	15.12 SF	1.54 LB
79	5F	Metal Floor		05310	Aluminum deck, VAB platform mod.	37.86 SF	8.53 LB

(1) Note the engineering cost here is also called the bid cost or more specifically, the estimated construction bid cost.

☐ GROUND SUPPORT EQUIPMENT — COST ESTIMATE — ☐ CONSTRUCTION

CODE: COST INDEX	DATE COMPLETED: 4/16/75 10/11/82	SHEET 36 OF ____ / SHEET 1 OF 5	
PROJECT/E.O. TITLE: CONCRETE WALLED TRENCH*, WITH SUPPORT BLOCKS** & GRATING***		DRAWING NO/ID: 79MDA930	SHEET NO.
STATION NO: 03300	LOCATION: 50' LONG X 2' WIDE X 2' DEEP KSC	PEN: 76485	PID/CCNS: 77406
ARCHITECT OR ENGINEER: PRC		WORK ORDER OR CONTRACT NO.: 0376/4603/4837	
ESTIMATOR: VARNELL, PRC-L391	CHECKED: W. Wright, PRC-L391	APPROVED	

SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR ($ OR MH) PER UNIT	LABOR TOTAL FOR	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
EXCAVATE TRENCH 1/3 HAND	30	CY	16.87	506	.68	16	
FORM-WORK FOR TRENCH	672	SF	2.60	1747	.90	605	MEANS
FORM-WORK FOR 3 SUPPORT BLOCKS	60	SF	2.60	156	.90	54	
#6 REBAR FOR TRENCH 7 @ 4 X 50'	335	LB	.20	67	.25	84	
#6 REBAR FOR SUPPORT BLOCKS 7 LEN.'-8"	53	LB	.20	11	.25	13	
POUR CONCRETE FOR TRENCH WALLS & FLR.	18	CY	10.00	180	43	774	
POUR CONCRETE FOR SUPPORT BLOCKS	1	CY	10.00	10	43	43	
ANCHOR BOLTS IN SUPPORT BLOCKS	10	EA	3.00	30	.60	6	
ANGLE FRAME SET IN CONCRETE	800	LB	.30	600	.45	360	
FINISH CONCRETE, TOP SURFACE	416	SF	.10	42	.05	21	
CURE CONCRETE TOP SURFACE	416	SF	.03	12	.03	12	
HARDENER, TOP SURFACE	104	SF	.03	3	.05	5	
2" CAST IRON GRATING, 108 S/F 26'W	5486	LB	.20	1087	.51	2798	Q
HAUL DIRT AWAY, 3 MILES	24	CY	.90	22	1.50	36	
BACKFILL 1/2 HAND	6	CY	10.08	60	.68	3	
SUBTOTAL				4363		4829	
FT&I & SALES TAX			26%	1,062	5%	241	
SUBTOTAL				5,385		5069	10,454
OVERHEAD	15%						1,568
SUBTOTAL							12,022
PROFIT	10%						1,202
SUBTOTAL							13,224
BOND	1%						132
TOTAL							13,356
COST PER LF (50) $267	COST PER CY (18) $742	COST PER SF (108) $124					
*NEENAH FOUNDRY - NEENAH, WISC. 414/725-3041 - MIKE RANKIN							
2" SOLID C.I. GRATING 26" WIDE - 3 - 4990-H-261-2"-26"							
108 SF - 50.3LB SF							

NSS FORM 31-44A (REV. 6/80)

FIGURE C

FIGURE E

DINGS | SHEET _____ OF _____

KSC | PROJECT SOLID ROCKET BOOSTER ROTATION & PROCESSING BLDG.

ESTIMATOR G. L. FILES, DMUM PRC-1391 | CHECKER PRC-1391 | CODE C-100 | SUBMITTED 5-27-82

UNIT	$ UNIT	$/BSF	TOTAL	DIV. TOTAL
SF	2.15	1.52		28,093
SF	.46	.31	5,762	
		.84	15,566	
SF	2.04	.05	985	-
A/R		.31	5,780	
				31,271
SF	107.46	1.69	31,271	
TON	4,085	51.34		545,365
TON	3,093.	15.07	116,005	
TON	2,607.	55.30	161,656	
TON	7,874.		267,704	(FROM VAB)
BSF	12.07	12.07		223,426
STOP	27,399.	8.88	164,395	$150,000
LF	295.16	3.19	59,031	
LF	39.00	28.01		518,710
LF	6.43	.62	11,572	
LF	28.67	5.95	110,230	
SF	50.43	1.62	30,008	
LF	50.83	14.99	277,531	
LF	40.71	4.83	89,369	
KVA	20,010.	64.84		1,200,600
FIXT.	266.78	3.92	72,565	
LF	26.73	1.88	34,879	
STA.	2,088.	1.47	27,139	
KVA	2,029.	6.57	121,720	
LF	10.89	2.12	39,202	
BSF	2.28	2.28	42,131	
BSF	3.79	3.79	70,220	
BSF	.76	.76	14,044	
		27.20	503,552	
KVA	137.57	14.86	275,148	
SF	52.16			1,295,560
SF	49.21			246,620
				7,690,060

DESCRIPTION

SCOPE (Circle one)	BASIC PLAN (Circle one)	COMMENTS
1. FAIR	A. SQUARE	35,216 TOTAL SQ. FT.(4 BLDGS) GOV'T. EST. DID NOT NEED SPL. COND. DUE TO ECONOMIC CONDITIONS.
2. AVERAGE	(B) RECTANGULAR	
(3) GOOD	C. IRREGULAR	
4. COMPLEX	D. VERY IRREGULAR	
5. SOPHISTICATED	E.	

(1)

DESIGN DATA

BLDG. TYPE: HANGAR
CAPACITY: _____
STRUC. FRAME: STEEL
EXTERIOR WALL: 20 GA. 3 RIB GALV. INSULATED
HEIGHT: 4 PLTFRMS STORIES: 100 FT.
GROUND FLOOR AREA: 18,628 SF
TOTAL FLOOR AREA: _____ SF
VOLUME: 1,844,172 CF
PERCENT AIR CONDITIONED: 0 % _____ TONS
OTHER: _____

SPECIAL FEATURES

(NIC) TWO 200 TON ELEC. BRIDGE CRANES $1,798,000
SUP. BLDG. 50'X100'X16" = $5,000 SF
(2) STOR. BLDG 65'X90'X47'-62'= 11,700 SF
ROTATION & PRO. BLDG. 198' 8"X89'8"
USED 4% SALES TAX. 5% EFFECTIVE 5-1-82

(2)

(3)

CONSTRUCTION BID DATA (IFB 10-0055-2)

TOTAL BLDG. SF:	18,516 (ROTATE & PRO. BLDG.)			
ARCH/STRUC:	$203.72	/BSF	$3,772,070	
INTERIOR MECH:	$ 8.20	/BSF	$ 151,810	
INTERIOR ELEC:	$ 22.79	/BSF	$ 421,900	
TOTAL INTERIOR:	$234.70	/BSF	$4,345,780	
TOTAL EXTERIOR:	$ 97.33	/BSF	$1,802,100	
TOTAL CONSTR:	$332.03	/BSF	$6,147,880	
ADDITIONAL BLDGS	$ 92.35	/BSF	$1,542,180	
SPL. COND.	$ 6.32	/BSF	$ 222,702	
TOTAL PROJECT EST:	$224.69	/BSF	$7,912,762	

BID DATE: 3-23-82
AWARDED TO: W&J CONSTR. $7,247,000
CONSTRUCTION TIME SPAN: 540 CALENDAR DAYS
NO. OF BIDDERS: 9 POSITION OF GOVT. EST. 8/9
PERCENT DIFFERENCE, AWARDED BID AND GOVT. EST. 8.4%
TIE BID. NASA PROCUREMENT REQUIRED LABOR SURPLUS EVALUATION. IT WAS LESS THAN 50%: SO AWARD TO SMALL BUSINESS.

(4)

BIDDERS.

W&J CONSTR.	(L)	$ 7,247,000
GREAT SOUTHWEST		$ 7,247,000
NORFLOR CONSTR		$ 7,449,880
ALGERNON BLAIR		$ 7,777,000
SCANDIA, INC.		$ 7,840,000
HOBBS CONSTR.		$ 7,900,000
GOV'T. EST.		$ 7,912,762
GULF CONTRACTORS	(H)	$ 9,597,000

(5)